A review of public-private partnership (PPP) studies in World Bank Designated Developing Countries

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Abstract

Despite the infrastructure development disparity between developed and developing nations, the reasons for the adoption of PPP procurement strategies by governments in these nations are the same. While PPP research has gained traction among researchers and academics across the globe, lots of the review-based studies on PPP have been either domain, source/journal or country-specific. Reviews of PPP research in developing countries are scarce. This study focused on World Bank designated developing countries to carry out a bibliometric analysis and content evaluation of 490 PPP studies extracted from the Scopus database in the built environment. The analyses showed that "The Journal of Construction Engineering and Management" is one of the prominent outlets for PPP publications in developing countries. The People's Republic of China is the most productive country in PPP research. Chan A.P.C., Zhang X., and Cheung E. were the leading authors, and the Survey research method (questionnaire and interview) was the most common. 'PPP promotion and performance studies' is the leading focus area for researchers, and "water and sewage" and "transportation" were the leading sectors of focus of the reviewed studies. There was a scarcity of studies on emerging industry 4.0 technologies promotion and adoption in long-term infrastructure PPP projects and this formed the basis for future research. This study will guide future researchers on the outlets to publish their works. It will also guide the International Monetary Fund (IMF) and World Bank and other corporate bodies on the sectors of the economy for investment and partnership purposes.

Keywords

Developing countries, Public-private partnerships, Built environment, Bibliometrics analysis, World bank

1. Introduction

Public-private partnerships (PPP) adoption in mega infrastructure projects and public services procurement, has grown since its introduction in the UK in the early 80s during the global economic crisis (Sadka, 2007). PPP adopts a broad procurement technique with expansive contractual links involving the public and private entities in the delivery of large-scale critical assets and /or services, for public good. PPP equally entailed enormous risks and rewards sharing between the contracting parties (Tang et al., 2013). Although PPP as a procurement method is well diffused and utilised in the mature nations of the UK, Spain, Portugal, Australia, the USA, Canada, and the Netherlands, among others, than in developing countries. However, recent developments showed it is rapidly gaining increased use in developing countries (Fu et al., 2023) with the interventions of multilateral organisations such as the International Monetary Fund (IMF).

The partnership and cooperation of the private and public sectors guarantee service delivery and standard of living and ensure that nations meet the socio-physical infrastructure needs of their citizenry. Thus, the problems of finance, lack of expertise, knowledge and management in the provision of public goods associated with the traditional system are overcome (Aladağ and Işik, 2020). Despite the huge national economic and developmental impact of PPP, it is still confronted with problems of poor risks sharing and allocation, stakeholder communication and management issues, poor service delivery, payment problems, and insufficient concession periods, among others, that have resulted in the high numbers of failures and early terminations (Sun et al., 2022; Tariq & Zhang, 2022).

Amidst the number of reported failures in PPP agreements, governments have continued to develop interest in the procurement route. In the same vein, the number of interested researchers and academics and publications on PPP have increased within the last 3 decades, and this is due to the quest to continue to report and disseminate experiences, gains and pains of PPP to the larger community. Review studies on PPP exist and while some are country-specific (Pu et al., 2021), others are domain centered (Osei-Kyei et al., 2022; Le et al., 2022) or journal-specific (Bao et al., 2018). Notwithstanding the significant contribution of existing studies to knowledge, the status and trends in PPP studies in World Bank-designated developing countries are yet to be considered. Considering the roles of corporate bodies, IMF and the World Bank in infrastructure provisions in developing countries via PPP, there is a need to have an overview of PPP publications within the built environment.

2. Research and Methodology

This study utilised the bibliometric and content analysis approaches to determine the trends and status of PPP studies in developing countries of the world, based on World Bank designation. Bibliometric techniques allow for the discovery of trends and patterns from a   pool of scientific body of knowledge. It offers visuals and displays links and relationships to measure publication citation counts, sources, co-occurrences, and among others (Sajovic et al., 2018). This literature review adopted a 3-stage process of (1) data extraction from the Scopus database, (2) Data screening, refinements, and inclusion, and (4) Data analysis (Bibliometrics analysis and Content analysis).

Data extraction and identification: 21,038 documents were initially extracted from the Scopus database. Scopus database does rapid indexing and is therefore a reliable source of recent scientific data, and it has found use for review-focused studies across many fields of studies globally. The database search took place on February 03, 2023, and was guided by the following keywords as the search string; *"(TITLE-ABS-KEY ("public-private partnerships" OR "PPPs projects" OR "PPPs" OR "private finance initiative" OR "public infrastructure" OR "Private Infrastructure" OR "PFI" OR "Build Operate Transfer" OR "BOT" OR "Build Operate Own Transfer" OR "BOOT")".*

Data screening, refinements, and inclusion: The 21,038 documents were screened by refining to documents in; (i) English language only, (ii) articles and conferences, (iii) the final stage of publication, (iv) subject areas-"Environmental sciences" and "Engineering", and (v) limited to the list of developing countries as designated by world bank (see, Endocrine Society, 2023). The time frame of the published documents was not limited to any period to avoid loss of vital data. In the end, 1,708 documents were retained in CSV file format for ease of analysis using VOSviewer software. A further skim-reading of the title, abstract and keywords further eliminated documents that escaped the screening, and this led to the retention of 490 documents. VOSviewer which is one of the commonly used tools for visualising bibliometric information was used to analyse the data.

Data analysis: Bibliometrics analysis aids the production of maps and networks that help to identify popular research outputs, sources, publication countries, authors and previous/existing trends in a specific topic of interest (Li et al., 2017). Citation analysis, co-authorship analysis and co-occurrence analysis were carried out using VOSviewer. The research area, research methods adopted, and the sectors covered by the PPP studies were established using content analysis.

3. Results and Discussion

3.1 Annual growth of PPP research in developing countries: The analysis results show that the 490 documents cover publications over 24-year periods (i.e., 1998-2023). PPP publications in developing countries have been on a steady increase since 1998 with at least one publication. From one publication in 1998 to a cumulative publication of 54 in 2011, then, 327 in 2020 and 490 in 2023 when the database search was carried out. The peaks were in 2020, 2021 and 2022 which recorded 61 each for 2020 and 2021 and 91 for 2022. Since the introduction of PPP in early 1980s and the successes recorded in the US and UK (Li et al., 2005), Governments interest in the procurement method has grown significantly, particularly in developing countries. The finding here supports the report of (Pu et al., 2021).

3.2 Leading publication outlets for PPP studies in developing countries: This was achieved through citation analysis of sources with at least 5 publications. Of the 72 sources, 23 documents met the threshold, but only the top 11 with at least 10 documents are presented in figure 1 below. Based on the number of documents, the most important sources of PPP studies are the Journal of Construction Engineering and Management; Engineering, Construction and

Architectural Management and Journal of Management in Engineering. This finding is in line with (Neto et al. 2016; Pu et al., 2021).
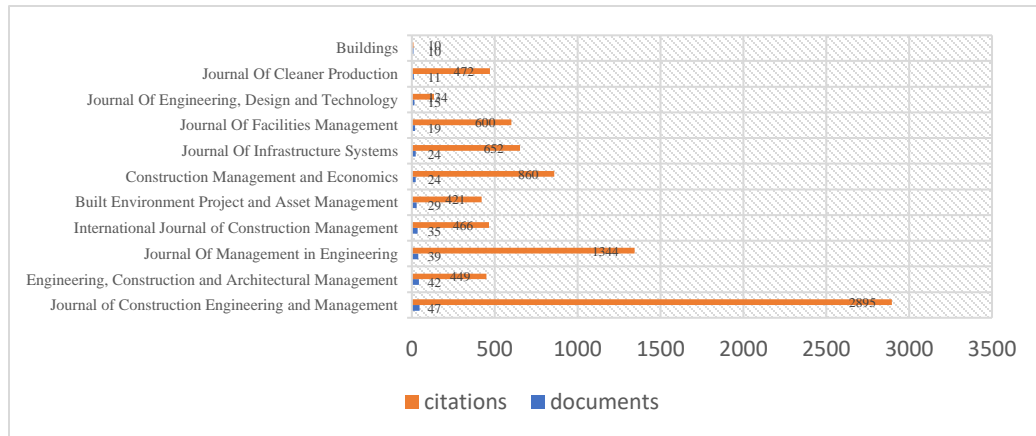

Figure 1: Leading publication outlets for PPP studies

3.3 Leading countries on PPP studies in developing countries: Citation analysis of countries, shows that out of 23 countries with at least 3 publications, China (citations=5377, f=177), Hong Kong (citations=4994, f=102), India (citations=692, f=43), Malaysia (citations=389, f=21), Ghana (citations=356, f=23), Nigeria (citations=283,f=18), and South Africa (citations=101, f=19), were the most productive countries with more studies on PPP among the developing countries. This finding will aid future collaborations among developing countries. With a focus on only developing countries/regions, this finding corroborates what was reported in (Ma et al.2019).

3.4 Most frequently cited PPPs publications: Based on the criterion of at least 10 citations for a publication, 239 documents met this criterion, and two of the leading studies with at least 200 citations are; Zhang X.(2005a) on "*Critical success factors for public-private Partnerships in infrastructure development*" (citations=472) and Chan et al.(2010a) "*Critical success factors for PPPs in infrastructure developments: a Chinese perspective*" (citation=275). As per the most impactful studies on PPP, this finding supports the work of (Zhang et al., 2020).

3.5 Collaboration by authors: The network visualisation in Figure 2 shows the result of the co-authorship analysis using authors as the unit of analysis and with inclusion criteria of at least 5 publications and 20 citations. 39 of the 840 authors met the threshold and formed seven clusters comprising 33 authors with at least 1 total link strength (TLS). Overall, the authors with the most collaborative powers based on their citations are, Chan A.P.C. (f =2999), Zhang X. (f =1600), Cheung E. (f =1190), Chan D.W.M. (f=807), Lam P.T.I. (f=691), and Wang S. (f=640). Related and previous PPP review studies show that these authors occupy the top collaborators too (Shi et al., 2020; Osei-Kyei et al., 2022). Inter-institutional collaboration should strengthen the chances of winning important research grants and funding. This finding could help potential researchers to find suitable researchers in PPP to collaborate with in grant applications, regardless of the locational limitations.
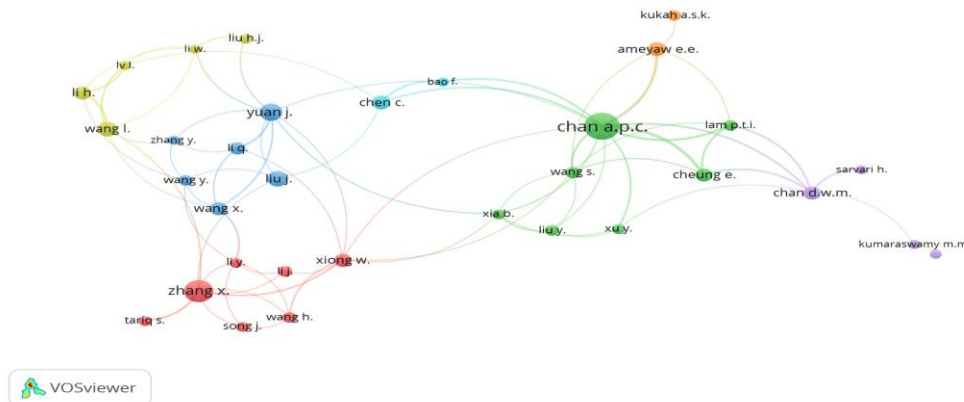

Figure 2: Collaboration of Authors in Developing Countries

3.6 Collaboration by countries: With at least 3 documents and a citation from a country, the co-authorship analysis was run using the country as a unit of analysis**.** 39 of the 61 countries met the threshold, however, only 16 countries are linked or interconnected. It was found that China and Hong Kong occupy a central position among other countries/regions in PPP research and this means that most PPP studies spring from the researchers in these areas and have collaborated with authors from other developing countries as evident in figure 3.

Figure 3: PPP Collaboration by Countries

3.7 Keywords co-occurrence network analysis and content analysis

The authors' keywords produced a readable knowledge map that can be reproduced (Darko et al., 2020). With the author's keywords used as the unit of analysis, 5 keywords were set as the minimum for the co-occurrence analysis. 70 keywords of a total of 1151 keywords produced a network of 5 clusters with 493 links and a total link strength of 816 (figure 4). Although written in different forms (e.g., public-private partnership (PPP), "public-private partnership" "public-private partnerships", PPPs; public-private partnerships have the largest nodes in four clusters in green, red, yellow, and blue colours, except for "infrastructure" in the cluster in purple colour. Megaprojects and infrastructure projects of a long-term nature are procured using PPP (Zhang, 2005b). Mega projects or infrastructure projects are delivered using PPP and not with the strained and limited resources of the public sector (governments). Therefore, it is common to leverage private sector expertise, finance, and resources to deliver such projects that impact millions of people.

To give this general overview of PPP studies in developing countries, the VOS viewer software was utilised. However, the research area, research methods adopted, and the sectors covered by the PPP studies were established using content analysis. This method is evident in previous PPP review studies (Zhang et al., 2020).

Figure 4: Keywords co-occurrence visualization network

3.8 Research focus of PPP studies in developing countries

The content analysis revealed six areas of focus of PPP studies (figure 5), and the most research area is "promotion and performance-related studies" (31.02%). A larger proportion of PPP researchers and academics in developing countries focus on promoting PPP and reporting the performance of infrastructure PPP in different sectors and countries as evidenced in (Li et al.,2023; Sun et al., 2022; Okudan et al., 2020). The second largest focus area is "risks and risks management-related studies" (29.39%). Mega infrastructure projects take a longer duration, involve multiple

and complex networks of stakeholders, and a host of risks and uncertainties, and these have been demonstrated in studies (Alada and Işik, 2022; Ameyaw and Chan, 2013; Wu et al., 2018) ."Procurement and Legal-related studies" are accounts for 12.24% of the reviewed studies and this include studies such as PPP procurement model section (Pu et al., 2020), selecting BOT infrastructure projects (Wibowo and Kochendoerfer, 2011), and among others.

Contract administration and management studies are the fourth areas of focus (12.04%). The long contract duration, complexity and number of stakeholders involved in PPP projects increase the risks and management responsibilities of the parties. The several contracts and subcontracts in PPP projects need to be administered effectively to avoid terminations and failures. However, issues related to PPP project termination and failure have been reported (Tariq and Zhang, 2022; Liu et al., 2017), and contract negotiations and renegotiations in PPP (Javed et al., 2014; Chen et al., 2022). Finance and financial-related studies are the fifth and constitute 9.80% of the review work and some of them are (Lu et al., 2019; Gbadegesin and Aluko, 2014; Zouggari, 2003). Studies on Governance issues (5.51%) are the 6th and include studies on the impact of governance on service delivery on PPP procurement (Dolla and Laishram, 2020), and relational governance and infrastructure sustainability in PPP projects (Tian et al., 2021).
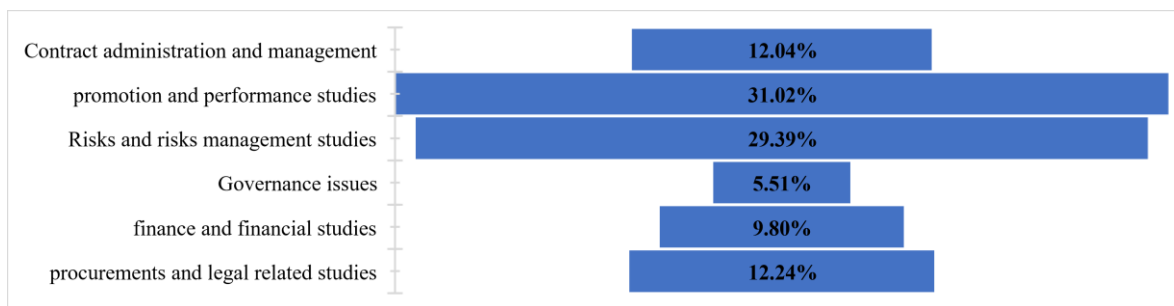
Figure 5: Focus of PPP research in developing countries

3.9 Adopted research methods
A further examination of the PPP studies shows that four research approaches were used, and the Survey approach (using questionnaires and/or interviews) was the most adopted by PPP researchers in developing countries as evident in 38.04% of the studies. Case studies reports are the second most used method (27.50%), and this is closely followed by modelling research (23.39%) and lastly literature review (11.07%) (figure 6). This supports the findings of (Tank et al., 2010)
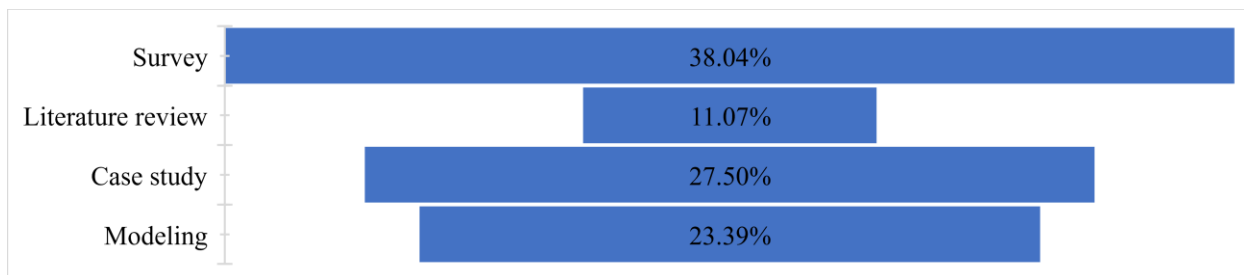

Figure 6: Research methods used in PPP studies

3.10 Most research sectors in PPP studies: While 40.61% of the studies cut across multiple sectors (project type not stated in studies), the remaining 59.39% focused on a specific sector. The distribution of the PPP studies reflect the sectorial problems or infrastructure needs of developing nations. Water and sewerage (22.04%), Transportation (21.02%), energy and power (9.80%), Municipal solid waste/waste recycling (2.86%), and housing (2.45%) are the prominent sectors of PPP studies in developing countries. The least reported sectors are Ecology and Environment protection (0.41%), Education (0.41%), Health (0.20%), and Sports (0.20%). It is important to note here that these least reported areas are essential to human existence and living, and would require the more investment interest from corporate investors and multilateral bodies.

4.0 Identification of future research direction

4.1 Emerging technologies-based solutions to mega PPP projects failures: Regardless of the industrialisation of countries, there have been reports of PPP projects suffering from time and cost performance failure, as well as contract terminations. This failure takes place in any project and at any stage of the PPP projects. According to Tariq and Zhang (2022) over 30% of PPP water and sanitation projects failed in sub-Saharan Africa and every year, a sizeable number of PPP projects face termination for performance problems (CPPPC, 2021), and this is more at the operational phase. Contracts and contractual compliance issues have been cited as the chief cause of PPP failures (Trangkanont and Charoenngam, 2014; Ameyaw and Chan, 2015; Zhang and Tariq, 2020). While there are modern transformative technologies that can help manage and build trust among the diverse and multiple stakeholders and parties in PPP projects, technology-driven intervention has been under-explored among PPP researchers in developing countries. Further, while the impact of BIM on PPP has been among the few technology-based studies in PPP, blockchain technology and smart contracts which enforce compliance of contractual conditions, provide secured and trust and transparent platforms and chains of traceable transactions in mega infrastructure and multi-stakeholder projects, have not been given any attention under the PPP procurement route. A study on the adoption of blockchain technology in PPP projects is required.

4.2 Resilience and Adaptive Infrastructure PPP projects: In the last decades the human population has been impacted by natural and environmental disasters such as flooding and earthquakes, and the impact cut across lives, economic and materials losses (United Nations Office for Disaster Risk Reduction (UNISDR), 2015). The practices of building rigid and inflexible structures have made it difficult for buildings, roads, and bridges to respond to varying environmental changes. The procurement of disaster adaptive and resilient structures is complex with high technical requirements and finance beyond what the traditional system can procure using taxpayers' monies by governments, thus, making PPP suitable for procuring such projects. The risks inherent in such projects with the associated environmental, social and economic impacts are not well understood and require future attention. The risk allocation strategies for such projects and the success factors need to be investigated.

4.3 **Other areas of future focus:** the review showed an obvious dearth of PPP research in the health, sports, education, and ecological sectors of developing countries. More studies are required in these sectors as they constitute areas that have an impact on humans and sustainability goals.

5. Conclusions

The study found that despite the maturing nature of the PPP market of developing countries, the number of publications from developing countries has maintained a continuous increase since 1998. From a publication in 1998 to a cumulative of 54 in 2011, then, 327 in 2020 and 490 in 2023 when the study was carried out. The prominent outlets of PPP studies in developing countries are "Journal of Construction Engineering and Management", "Engineering, Construction and Architectural Management", and "Journal of Management in Engineering". The leading regions for PPP studies are China, Hong Kong, India, Malaysia and Ghana. Researchers and academics such as Chan A.P.C., Zhang X., Cheung E., Chan D.W.M., and Lam P.T.I., are the most cited and leading authors with strong collaborative powers. Furthermore, China and Hong Kong are at the forefront of the 16 countries/regions that have strong collaborative powers. Most PPP studies from developing countries used more Surveys (questionnaires and interviews) approach more than case studies, modelling and literature review approaches. PPP studies from developing countries focus on six main areas and they are PPP promotion and performance studies, risks and risks management studies, contract administration and management, procurement and legal issues, governance issues and finance and financial studies. A larger proportion of the studies are focused on water and sewage, transportation, energy and power, and waste sectors.

This study achieved its purpose but is however suffers from limitations such as; the data used were obtained solely from the Scopus database, thus, PPP publications indexed in other databases (e.g., Google Scholar, Web of Science (WoS)) were not considered and this could have impacted the citations, productivity of countries and authors. Also, there may have been countries not captured in the World Bank list and this might impact the generalisation of the findings. The authors relied on their experience and knowledge limitations to categorise the research focus and this might have introduced some bias that might limit the generations of the findings

This study however makes a meaningful contribution to the body of knowledge as well as in practice. Traceability, trust and transparency remain a key challenge in the traditional paper-based project delivery approach. Industry 4.0 technologies, particularly blockchain and smart contracts adoption in PPP projects will help improve the performance

and mitigate PPP failure triggers. Various aspects of the promotion of these technologies could be explored in PPP projects. Exploring the provision of climate-responsive adaptive and resilient PPP-procured infrastructure will help in guiding Governments and policymakers on their investment decision regarding saving lives and properties, and in meeting sustainable development goals (SDGs).

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